

Table 6-1
Performance Evaluation Sample Results
December 1999
WCP East Grand Avenue WQARF Site Remedial Investigation

Compound	Value Reported (µg/L)	True Value (µg/L)	Lower Control Limit (µg/L)	Upper Control Limit (µg/L)	Acceptable Result?	Percent Recovery
Benzene	14	17.8	14.2	21.4	No	78.6
Carbon Tetrachloride	17	16.7	13.4	20	Yes	101.8
Chlorobenzene	6	6.98	4.19	9.77	Yes	85.9
1,2-Dichloroethane	14	14.0	11.2	16.8	Yes	100
1,1-Dichloroethene	12	13.8	11	16.6	Yes	86.9
cis-1,2-Dichloroethene	6	8.05	4.83	11.3	Yes	74.5
trans-1,2-Dichloroethene	7	9.11	5.47	12.8	Yes	76.8
1,2-Dichloropropane	13	15.8	12.6	19	Yes	82.2
Ethylbenzene	13	14.8	11.8	17.8	Yes	87.8
Methylene chloride	8	10.8	8.64	13	No	74.1
Styrene	ND	14.7	11.8	17.6	No	NC
Tetrachloroethene	17	18.4	14.7	22.1	Yes	92.4
Toluene	11	11.6	9.28	13.9	Yes	94.8
1,1,1-Trichloroethane	7	8.33	5.00	11.7	Yes	84.0
1,1,2-Trichloroethane	10	10.4	8.32	12.5	Yes	96.2
Trichloroethene	16	15.0	12.0	18	Yes	106.0
Vinyl chloride	7	8.6	5.16	12	Yes	81.4
o-Xylene	8	8.62	5.17	12.1	Yes	92.8
m/p-Xylenes	23	25.4	20.34	30.5	Yes	90.5
Xylenes, total	32	34.0	27.2	40.8	Yes	94.0
Average Percent Recovery						88.4

Total Number of Possible Results	20
Number of Acceptable Results	17
Number of Unacceptable Results	3
Percent of Acceptable Results	85%

NC = Not Calculable

ND = Not detected above the method detection limit

µg/L = micrograms per liter

Table 6-2
Performance Evaluation Sample Results
May 2, 2001
WCP East Grand Avenue WQARF Site Remedial Investigation

Compound	Value Reported (µg/L)	True Value (µg/L)	Lower Control Limit (µg/L)	Upper Control Limit (µg/L)	Acceptable Result?	Percent Recovery
Benzene	6.0	6.55	3.93	9.17	Yes	91.6
Carbon Tetrachloride	7.0	10.7	8.56	12.8	No	65.4
Chlorobenzene	9.0	11.4	9.12	13.7	No	78.9
1,2-Dichloroethane	11.0	13.4	10.7	16.1	Yes	82.1
1,1-Dichloroethene	4.0	4.05	2.43	5.67	Yes	98.8
cis-1,2-Dichloroethene	31.0	31.7	25.4	38.0	Yes	97.8
trans-1,2-Dichloroethene	9.0	9.17	5.5	12.8	Yes	98.1
1,2-Dichloropropane	6.0	6.34	3.8	8.88	Yes	94.6
Ethylbenzene	2.0	2.77	1.66	3.88	Yes	72.2
Methylene chloride	19.0	18.9	15.1	22.7	Yes	100.5
Styrene	8.0	9.31	5.59	13.0	Yes	85.9
Tetrachloroethene	9.0	13.1	10.5	15.7	No	68.7
Toluene	16.0	19.3	15.4	23.2	Yes	82.9
1,1,1-Trichloroethane	9.0	11.9	9.52	14.3	No	75.6
1,1,2-Trichloroethane	18.0	16.3	13.0	19.6	Yes	110.4
Trichloroethene	8.0	9.7	5.82	13.6	Yes	82.5
Vinyl chloride	20.0	25.0	15.0	35.0	Yes	80.0
o-Xylene	5.0	6.38	3.83	8.93	Yes	78.4
m/p-Xylene	18.0	25.51	18.43	32.6	No	70.6
Xylenes, total	25.0	31.9	25.5	38.8	No	78.4
Average Percent Recovery						84.7

Total Number of Possible Results	20
Number of Acceptable Results	14
Number of Unacceptable Results	6
Percent of Acceptable Results	70%

µg/L = micrograms per liter

Table 6-3
Performance Evaluation Sample Results
May 7, 2001
WCP East Grand Avenue WQARF Site Remedial Investigation

Compound	Value Reported (µg/L)	True Value (µg/L)	Lower Control Limit (µg/L)	Upper Control Limit (µg/L)	Acceptable Result?	Percent Recovery
Benzene	5	5.24	3.14	7.34	Yes	95.4
Carbon Tetrachloride	9	8.56	6.85	10.2	Yes	105.1
Chlorobenzene	8	9.12	7.3	10.9	Yes	87.7
1,2-Dichloroethane	11	10.7	8.58	12.9	Yes	102.8
1,1-Dichloroethene	4	3.24	1.94	4.54	Yes	123.5
cis-1,2-Dichloroethene	23	25.4	20.3	30.4	Yes	90.6
trans-1,2-Dichloroethene	8	7.34	4.4	10.2	Yes	109.0
1,2-Dichloropropane	5	5.07	3.04	7.10	Yes	98.6
Ethylbenzene	2	2.22	1.33	3.10	Yes	90.1
Methylene chloride	16	15.1	12.1	18.1	Yes	106.0
Styrene	7	7.45	4.47	10.4	Yes	94.0
Tetrachloroethene	9	10.5	8.38	12.6	Yes	85.7
Toluene	15	15.4	12.4	18.5	Yes	97.4
1,1,1-Trichloroethane	10	9.52	7.62	11.4	Yes	105.0
1,1,2-Trichloroethane	14	13.0	10.4	15.6	Yes	107.7
Trichloroethene	8	7.76	4.66	10.9	Yes	103.1
Vinyl chloride	19	20.0	12.0	28.0	Yes	95.0
o-Xylene	5	5.10	3.06	7.15	Yes	98.0
m/p-Xylene	17	20.4	14.8	26.1	Yes	83.5
Xylenes, total	24	25.5	20.4	30.6	Yes	94.1
Average Percent Recovery						98.6

Total Number of Possible Results	20
Number of Acceptable Results	20
Number of Unacceptable Results	0
Percent of Acceptable Results	100%

µg/L = micrograms per liter

Table 6-4
Summary of Field Quality Control Sample Results ^(1,2)
WCP East Grand Avenue WQARF Site Remedial Investigation

Sample Event	QC Sample	Affected SDG	Detected Contaminant	Data Validation Recommendation ^(3,4)
Vadose Zone Investigation (SB8 through SB17)	Trip Blanks	9909G970 9909G850	Methylene chloride	No flags were recommended for affected samples that were non-detect. The reporting limit was raised for samples with positive results.
	Equipment Blanks	9909G828	Methylene chloride	No data qualifiers were recommended because these compounds were not detected in the laboratory blanks, trip blanks, and associated samples for the affected SDGs.
		9909G838	Chloroethane, 1,1-dichloroethene, methylene chloride, and cis-1,2,-dichloroethene	
		9909G880	1,1-dichloroethene and 4-methyl-2-pentanone	
	Field Duplicates			All analytes that were not non-detect had RPDs within the acceptance criteria.
Phase III Well Installation (WCP-40 through WCP-46)	Trip Blanks	9909G328 9909G138	Chloromethane, 2-butanone, 4-methyl-2-pentanone, and 2-hexanone	No flags were recommended for affected samples that were non-detect. The reporting limit was raised for samples with positive results.
	Equipment Blanks	9910G241 9910G328 9912G006 9912G043	Acetone and 4-methyl-2-pentanone	All affected samples were non-detect for 4-methyl-2-pentanone therefore flags were not required. The reporting limit for affected samples with positive acetone results was raised to the observed sample concentration.
	Field Duplicates			All analytes that were not non-detect had RPDs within the acceptance criteria.
Groundwater Samples (Round 1)	Trip Blanks		None	Not applicable.
	Equipment Blanks	9912G405 9A01G414	Acetone	Acetone was not detected in any of the associated samples. No data qualifiers were recommended.
	Field Duplicates	9912G405	cis-1,2-dichloroethene	WCP-15 - 3 µg/L; Duplicate - 4 µg/L; RPD = 28.6
Groundwater Samples (Round 2)	Trip Blanks			No analytes were found above the detection limit.
	Equipment Blanks	9A02G872	Acetone, toluene, and m,p-xylenes	These compounds were not detected in the samples. No data qualifier flags were recommended.
	Field Blanks	9A02G872	Acetone, toluene, and m,p-xylenes	These compounds were not detected in the samples. No data qualifier flags were recommended
	Field Duplicates	9A02G872	1,1-dichloroethene	WCP-30 – 69 µg/L; Duplicate – 54 µg/L; RPD = 24.4
Groundwater	Trip Blanks			No analytes were found above the detection limit

Table 6-4 (continued)
Summary of Field Quality Control Sample Results ^(1,2)
WCP East Grand Avenue WQARF Site Remedial Investigation

Sample Event	QC Sample	Affected SDG	Detected Contaminant	Data Validation Recommendation ^(3,4)
Samples (Round 3)	Equipment Blanks	9A03G239	Acetone	None of these analytes were detected in the samples. No data qualifiers recommended.
		9A03G270	Acetone, benzene, toluene, m,p-xylenes, total xylenes	
		9A03G271	Acetone	
	Field Blanks	9A03G239	Acetone	Acetone was not detected in the samples. No data qualifiers recommended.
	Field Duplicates	9A03G239 9A03G270		All analytes with positive results had acceptable RPDs.
Groundwater Samples (Round 4)	Trip Blanks	9A06G630 9A06G666	Methylene chloride	Not detected in the samples. No qualifiers recommended.
		9A06G682	Methylene chloride Methyl-tert-butyl-ether	The reporting limit of affected samples was raised to the observed concentration.
	Equipment Blanks	9A06G630	Methylene chloride, acetone, carbon disulfide, chloroform	Methylene chloride, acetone, and carbon disulfide were not detected in the samples. No qualifiers were recommended. Chloroform was detected in samples. The reporting limit of affected samples was raised to the observed concentration.
	Field Blanks	9A06G630	Methylene chloride, acetone, carbon disulfide, chloroform	
	Field Duplicates	9A06G666 9A06G682		All analytes with positive results had acceptable RPDs.
Deep Well Installation (WCP-48)	Trip Blanks	9A06G746	Methyl-tert-butyl-ether	Not detected in the samples. No qualifiers recommended.
		9A06G811	Bromomethane	The reporting level in affected samples was raised to the observed concentration.
		9A06G810 9A08G428	Methylene Chloride	Not detected in the samples. No qualifiers recommended.
	Equipment Blanks			All analytes reported as non-detect.
	Field Duplicates	9A06G810		All analytes reported as non-detect.
Groundwater Samples	Trip Blanks	9A09G600	Methylene chloride	The reporting limit of affected samples was raised to the observed concentration.

Table 6-4 (continued)
Summary of Field Quality Control Sample Results ^(1,2)
WCP East Grand Avenue WQARF Site Remedial Investigation

Sample Event	QC Sample	Affected SDG	Detected Contaminant	Data Validation Recommendation ^(3,4)
(Round 5)	Equipment Blanks	9A09G688	Acetone, methylene chloride and trichloroethene	The reporting limit of affected samples was raised to the observed concentration.
	Field Blanks			All analytes reported as non-detect.
	Field Duplicates	9A09G614 9A09G600		All positive results had acceptable RPDs.
Groundwater Samples (Round 6)	Trip Blanks	9A12G073	Acetone and trichloroethene	Acetone not detected in the samples. No data qualifiers were recommended. The reporting limit of samples with less than 5x the blank concentration of TCE was raised to the blank concentration. No flags were recommended for samples with results greater than 5x the blank concentration.
		9A12G076	Trichloroethene and tetrachloroethene	Not detected in associated samples. No qualifier flags recommended.
	Equipment Blanks			All analytes reported as non-detect.
	Field Blanks			All analytes reported as non-detect.
	Field Duplicates	9A12G065	Tetrachloroethene	WCP-15 – 47 µg/L; Duplicate – 61 µg/L; RPD 25.9
		9A12G073		All positive results had acceptable RPDs.
Phase IV Well Installation	Trip Blanks			All analytes were reported as non-detects.
	Equipment Blanks			All analytes were reported as non-detects.
	Field Blanks			All analytes were reported as non-detects.
	Field Duplicates	201757 201850		All analytes were reported as non-detect.
Groundwater Samples (Round 7)	Trip Blanks	202148	Acetone	The reporting limit of affected samples was raised to the observed concentration if the sample concentration was less than 10x the concentration of the blank. If greater than 10x the blank concentration, no flags were recommended.
		202167	Acetone and 2-butanone	Affected samples flagged as explained above.
Groundwater Samples	Trip Blanks	202180 202691	Acetone	Affected samples flagged as explained above.

Table 6-4 (continued)
Summary of Field Quality Control Sample Results ^(1,2)
WCP East Grand Avenue WQARF Site Remedial Investigation

Sample Event	QC Sample	Affected SDG	Detected Contaminant	Data Validation Recommendation ^(3,4)
(Round 7)	Equipment Blanks	202148 202251	Acetone	Affected samples flagged as explained above.
	Field Blanks	202148	Acetone	Affected samples flagged as explained above.
	Field Duplicates	202167 202180 202274		All analytes with positive results had acceptable RPDs.
Groundwater Samples (Round 8)	Trip Blanks	203007	Acetone	The reporting limit of affected samples was raised to the observed concentration
		203050 203083	Acetone	Not detected in the samples; no additional flags were necessary regarding blank contamination.
	Equipment Blanks	203196	Acetone	Not detected in samples. No data qualifier flags recommended.
	Field Blanks			All analytes were reported as non-detect.
	Field Duplicates	203050 203130		All analytes with positive results had acceptable RPDs.
Aquifer Test	Trip Blanks	203546		All analytes were reported as non-detect.
	Equipment Blanks			Not collected.
	Field Blanks			Not collected.
	Field Duplicates			Not collected.
Groundwater Samples (Round 9)	Trip Blanks	203744	Dibromochloromethane	The reporting limit of affected samples was raised to the observed concentration if the sample concentration was less than 5x the concentration of the blank. If greater than 5x the blank concentration, no flags were recommended.
		203808 203820 203837 203894 203957	Acetone	The reporting limit of affected samples was raised to the observed concentration if the sample concentration was less than 10x the concentration of the blank. If greater than 10x the blank concentration, no flags were recommended.
	Equipment Blanks			All analytes were reported as non-detect.

Table 6-4 (continued)
Summary of Field Quality Control Sample Results ^(1,2)
WCP East Grand Avenue WQARF Site Remedial Investigation

Sample Event	QC Sample	Affected SDG	Detected Contaminant	Data Validation Recommendation ^(3,4)
	Field Blanks			All analytes were reported as non-detect.
	Field Duplicates	203820 203837		All analytes with positive results had acceptable RPDs.
		203932	1,1-dichloroethene Trichloroethene Tetrachloroethene	WCP-87 – 206 µg/L; Duplicate 145 µg/L; RPD 34.7 WCP-87 – 249 µg/L; Duplicate 153 µg/L; RPD 47.8 WCP-87 – 330 µg/L; Duplicate 175 µg/L; RPD 61.4
Groundwater Samples (Round 10)	Trip Blanks	203988 204015 204041	Acetone	The reporting limit of affected samples was raised to the observed concentration if the sample concentration was less than 10x the concentration of the blank. If greater than 10x the blank concentration, no flags were recommended.
		204093	Acetone, trichloroethene	Samples affected by acetone contamination were flagged as explained above. The reporting limit of samples affected by trichloroethene was raised to the observed concentration if the sample concentration was less than 5x the blank concentration. If greater than 5x the blank concentration, no flags were recommended.
		204143	Acetone, bromomethane, toluene, and methylene chloride	Samples affected by acetone contamination were flagged as explained above. Bromomethane, toluene, and methylene chloride were not detected in the associated samples. No flags were recommended.
		204200	Methylene chloride	Not detected in samples. No flags were recommended.
	Equipment Blanks			All analytes were reported as non-detect.
	Field Blanks			All analytes were reported as non-detect.
Groundwater Sampling (Round 10)	Field Duplicates	204066 204143 204166		All analytes with positive results had acceptable RPDs.
Phase V Well Installation	Trip Blanks	204235 204263 204328 204406 204448 204521 204565	Methylene Chloride	No flags were recommended for affected samples that were non-detect. The reporting limit was raised for samples with positive results.

Table 6-4 (continued)
Summary of Field Quality Control Sample Results ^(1,2)
WCP East Grand Avenue WQARF Site Remedial Investigation

Sample Event	QC Sample	Affected SDG	Detected Contaminant	Data Validation Recommendation ^(3,4)
	Equipment Blanks	204406	Chloromethane	No flags were recommended for affected samples that were non-detect. The reporting limit was raised for samples with positive results.
		204565		All analytes were reported as non-detect.
	Field Blank	204406	Methylene Chloride	Not detected in samples. No flags were recommended.
	Field Duplicates	204263		All analytes were reported as non-detect.
		204406 204565		All analytes detected had acceptable RPDs.
Groundwater Sampling (Round 11)	Trip Blanks	204680 204727 204752 204763 204788 204840 204932 204962 204996	Methylene Chloride	No flags were recommended for affected samples that were non-detect. The reporting limit was raised for samples with positive results.
		204698 204816 204962	Acetone Methylene Chloride	All analytes were reported as non-detect.
		204870	Acetone Chloromethane Methylene Chloride	No flags were recommended for affected samples that were non-detect. The reporting limit was raised for samples with positive results.
		204680	Methylene Chloride	All samples were reported as non-detect.
		204763	Acetone Methylene Chloride	All samples were reported as non-detect.
		204727 204788 204840 204870		All analytes detected had acceptable RPDs.
	Field Blank			
	Equipment Blanks			
	Field Duplicates			
Groundwater Sampling (Round 12)	Trip Blanks	205606	Trichloroethene	The reporting limit was raised to the observed concentration in the blank if the sample concentration was less than 5x the blank concentration. If greater than 5x the blank concentration, no flags were recommended.

Table 6-4 (continued)
Summary of Field Quality Control Sample Results ^(1,2)
WCP East Grand Avenue WQARF Site Remedial Investigation

Sample Event	QC Sample	Affected SDG	Detected Contaminant	Data Validation Recommendation ^(3,4)
		205632	Methylene Chloride	No flags were recommended for affected samples that were non-detect. The reporting limit was raised for samples with positive results.
	Equipment Blanks	205632		All analytes were reported as non-detect.
	Field Blank	205606	Tetrachloroethene	The reporting limit was raised to the observed concentration in the blank if the sample concentration was less than 5x the blank concentration. If greater than 5x the blank concentration, no flags were recommended.
	Field Duplicates	205632 205676	Methylene Chloride	All analytes detected had acceptable RPDs. WCP-16 – 0.6 µg/L; Duplicate 1.0 µg/L; RPD 50.0
Groundwater Sampling (Round 13)	Trip Blanks	206374 206491 206602	Methylene Chloride	No flags were recommended for affected samples that were non-detect. The reporting limit was raised for samples with positive results.
		206436 206472 206538 206602		All analytes were reported as non-detect.
		206406		All analytes were reported as non-detect.
	Field Duplicates	206734 206436 206491		All analytes detected had acceptable RPDs.
		206602	Chloroform\ cis-1,1-dichloroethene	WCP-93 – 2 µg/L; Duplicate 1 µg/L; RPD 66.7 WCP-93 – 2 µg/L; Duplicate 0.9 µg/L; RPD 75.8
Phase VI Well Installation	Trip Blanks	206679 206768 206803 206945	Acetone and methylene chloride	Not detected in samples. No flags were necessary.
		206740 207017	Methylene chloride	Not detected in samples. No flags were necessary.
	Equipment Blanks	206803 207017		All analytes were reported as non-detect.
	Field Blank	206803		All analytes were reported as non-detect.

Table 6-4 (continued)
Summary of Field Quality Control Sample Results ^(1,2)
WCP East Grand Avenue WQARF Site Remedial Investigation

Sample Event	QC Sample	Affected SDG	Detected Contaminant	Data Validation Recommendation ^(3,4)
	Field Duplicates	206803 207017 207254		All analytes detected had acceptable RPDs.
Groundwater Sampling (Round 14)	Trip Blanks	207154 207292 207313		All analytes either not detected or detected below the reporting limits.
	Equipment Blanks			None collected.
	Field Blank			None collected.
	Field Duplicates			None collected.
Groundwater Sampling (Round 15)	Trip Blanks			All analytes either not detected or detected below the reporting limits.
	Equipment Blanks	207752		All analytes either not detected or detected below the reporting limits.
		207869	Tetrachloroethene and trichloroethene	The reporting limit was raised to the observed concentration in the blank if the sample concentration was less than 5x the blank concentration. If greater than 5x the blank concentration, no flags were recommended.
	Field Blank	207673 207804		All analytes either not detected or detected below the reporting limits.
	Field Duplicates	207752	Chloroform	WCP-90 – 3 µg/L; Duplicate 4 µg/L; RPD 28.6
		207804		All analytes were reported as non-detect.
		207869	Trichloroethene	WCP-202– 2 µg/L; Duplicate – 3 µg/L; RPD 40.0

Table 6-4 (continued)
Summary of Field Quality Control Sample Results^(1,2)
WCP East Grand Avenue WQARF Site Remedial Investigation

Notes:

- 1) Analyses of blank samples were not detected above the method detection limit (MDL) unless listed otherwise.
- 2) Analyses of field duplicates were within the relative percent difference (RPD) acceptance criteria unless listed otherwise. Values near the MDL often result in a high RPD. When the data were near the MDL, a “five times” rule was used in evaluating the RPD of field duplicates. Results greater than five times the MDL were evaluated against the criteria listed in the QAPP (RPD $\leq 20\%$ for water, $\leq 50\%$ for soil). RPDs for analyte concentrations that were less than five times the MDL were evaluated on a case-by-case basis.
- 3) For blank samples with detected contaminants that are common laboratory contaminants (acetone, 2-butanone, methylene chloride), data qualifiers were not applied to associated sample results that were less than ten times the highest blank result. Instead, the reporting limit was raised to the observed concentration. No flags were recommended for those samples that were non-detect or greater than ten times the blank concentration.
- 4) For blank samples with detected contaminants that are not common laboratory contaminants, data qualifiers were not applied to associated sample results that were less than five times the highest blank result. Instead, the reporting limit was raised to the observed concentration. No flags were recommended for those samples that were non-detect or greater than five times the blank concentration.

SDG = Sample delivery group